PART II
SECTION 11, IRRIGATION SYSTEM

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, and equipment necessary to perform the complete scope of irrigation work as specified to insure the system is fully and properly operational.

B. If irrigation plans are not included, provide complete irrigation plans and schedule, as part of scope of work, to a degree, detail, and inclusion that such plans will be accepted for all necessary permitting required completing the project per plans and as set forth in these specifications. This may or may not require providing details of equipment and/or their connections to comply with local codes.

C. Facilitate the complete and proper construction of the landscape irrigation system including, but not limited to:

1. All piping including but not limited to mains, laterals, fittings, sleeves, connections, tees, risers and clamps.

2. All valves including control/shut-off, ball, globe, zone, pressure-reducing, quick coupling and including valve boxes, markers, connections, operators, fill, wire splice kits, detectable underground warning tape and other accessories.

3. Complete automatic control system, including controllers, controller enclosure/slab/pedestal and mounting, programming, wired conduit runs, rain sensor device (if applicable), and control valve wiring connections.

4. Complete electrical connection of the controller to service panel location.

5. Connections of piping to the supply source utilizing a meter and installing a backflow prevention device and flow meter at the meter location as per local code.

6. All excavation, site work, relocation or replacement of utilities, backfill and restoration of all disturbed areas and circumstances.

7. Provide a complete and properly-operable system for the irrigation of all proposed landscape areas on the project site. These specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project. This in no way relieves the Contractor of his

responsibility to furnish any additional labor, methods, materials and equipment required for a proper irrigation system as part of this scope of work.

8. Adjust any system components to work with existing and proposed landscaping.

9. Supply, deliver, store, and protect all equipment and materials, including pipe and fittings, valves, controllers, wire, and all other component parts necessary for the installation of a fully automatic irrigation system as indicated in these specifications.

D. Complete sod, planting, pavement, and other restoration in all areas that are trenched or damaged during the installation of the irrigation system upon completion of the project.

1.02 DESCRIPTION OF SYSTEM

A. This system will be designed as a typical block valve type using various components including, but not limited to sprinklers, rain sensor device, programmable electronic automatic controller, remote electronic valves, backflow prevention device, etc. The individual irrigation system shall be controlled by a new, most-recent model, Rain Bird® ESP-LX Series electronic controller, depending on the size, limits, and conditions of the project, and as determined by the Public Works Department designee and or City project manager.

B. The water source for this system shall be from an existing City potable water system. Contractor to coordinate with the Public Works Department for necessary requirements of new meter installation. Contractor shall be responsible for all fees to do the necessary work as required by the City, including labor, materials, permit, coordination, etc., and shall consider these fees as part of their contract.

1.03 QUALITY ASSURANCE

A. All relevant ANSI, AWWA, and ASTM Standards and Specifications shall apply, and all applicable building codes and approvals from other public agencies having jurisdiction upon the work.

B. The Contractor shall be responsible for constructing the system in complete accordance with all local codes, ordinances and laws. The Contractor shall install all sprinkler heads according to the manufacturer's specifications with regard to installation depth, distance between heads, etc. unless otherwise directed in writing by the Public Works Department. Any modification made to conform to any codes, laws, ordinances and specifications shall be completed at the Contractor's expense with no additional compensation allowed.

C. Protection of Existing Site Conditions and Materials: The Contractor shall take all necessary precautions to protect site conditions and materials to remain. Should damage occur, Contractor shall repair the damage to original condition or better at their expense.

1. The Contractor shall avoid trenching through the roots of any existing trees, and shall alert the City Urban Forester and Public Works Department designee before conducting any such activity that may damage tree root systems.

D. Permits and Fees: Contractor shall be responsible for obtaining all permits and pay all required fees to any governmental agency having jurisdiction over the work. Inspections required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to the Public Works Department showing that all work has been installed in accordance with all ordinances and code requirements.

E. Contractor shall ensure full, 100% overlap coverage (*minimum* head to head) in all areas to receive irrigation, and shall be responsible for adding additional heads, zones, components, or other equipment as required to achieve such coverage. To clarify, “head to head” is defined as the farthest edge of the water throw trajectory of a single head extends to or overlaps the adjacent irrigation head(s).

F. Rotor type heads are preferred for turf areas when such areas are large enough to accommodate rotors without overspray on to hard surfaces. Pop-up spray heads utilized in turf areas shall be minimum 6” pop-ups to effectively spray over grass between mowing service visits.

G. Pop-up spray heads, spray heads on risers or Netafin micro-irrigation (approved in writing by the Public Works Department) to be used to irrigate landscape beds. Landscape beds (shall be irrigated by spray heads/Netafin only) zoned separately from turf areas (irrigated by rotors). **At no time should there be both rotors and spray heads, or drip irrigation and spray heads on the same zone.**

F. Workmanship: All work shall be installed by skilled personnel, proficient in the trades required, in a neat, orderly, and responsible manner with recognized standards of workmanship. The Contractor should have installed at least five projects of similar magnitude and demonstrated ability in the installation of sprinkler irrigation systems of this type. Some manufacturers may require factory certification for construction/installation of their products. In such cases, Contractor shall verify before bidding/constructing the project and bid shall be inclusive of any and all direct or related costs.

1.04 SUBMITTALS

A. Submit shop drawings to project manager and Public Works Department designee for all irrigation system equipment, indicating all details required for the proper construction including, but not limited to: controller(s), electronic valves, manual valves, flow meters, backflow preventer, rain sensor device, etc. Where appropriate, and when approved by the City, manufacturer's product data for the proposed components may be substituted for shop drawings.

1.05 SUBSTITUTIONS

A. A written request for approval to substitute a material's type, grade, quality, etc. due to the non-availability of the material specified may be submitted to the project manager and the Public Works Department designee. Approval of the substitution must be given in writing by the project manager and the Public Works Department designee before the material is ordered, delivered, or installed on the project.

1.06 CHANGES AND ADDITIONAL WORK

A. The Contractor shall not begin any changes or additional work pertaining to the project until the City and the Contractor have executed a written agreement setting forth the adjusted contract amount. Any work performed on any changes or additional work prior to the execution of a written agreement may not be compensated by the City.

B. The Public Works Department reserves the right to adjust the number and location of sprinkler heads and other equipment in order to provide for any modifications which might become necessary.

1.07 GUARANTEE

A. Contractor shall warranty the entire irrigation system against defects, poor workmanship, discrepancies, deficiencies, and malfunction for a minimum of one calendar year from the time of final acceptance. Warranty shall include, but not be limited to, all parts and components included in the system and its installation, and all labor-related items regarding the procurement, assembly, installation, and operation of the system including any and all of its components. An inspection, to be arranged and coordinated by the Contractor and to include the Contractor, the project manager, and Public Works Department designee, shall be made at the beginning and end of the guarantee period.

1.08 QUALITY AND GRADE OF REPLACEMENT

A. All replacement material shall be equal to or better in regards to size, quality, quantity, and grade, as that of the material to be replaced, unless directed otherwise by the project manager and Public Works Department designee.

B. Replacement components and labor shall be guaranteed for a period of one year. This guarantee period shall begin at time of acceptance of the replacement material and/or workmanship.

C. Final payment to the Contractor shall in no way, either expressed or implied, relieve the Contractor of any guarantee obligations.

1.09 AS-BUILT DRAWINGS

A. As-Built drawings shall comply with Part I, Section 1 of this Manual, and the following: After final acceptance of project, Contractor shall furnish complete as-built drawings at the same size and scale as the original bid documents and an electronic .dwg file, that show the following: scaled drawings that show the locations of all valves and piping (with dimensions where required or necessary), horizontal or vertical dimensions measured from permanent/fixed objects (buildings, sidewalks, etc.) for the following that include, but are not limited to: feed pipe(s), mainline pipe(s), all lateral lines, controller location, remote control/ball/valves, quick coupler valves, backflow preventer, meter and point source connection, wiring/conduit, sleeves, wire splices, and sprinkler heads. The drawings shall also indicate and show any and all approved substitutions including size, material, and manufacturer's name and catalog number. All piping shall be labeled to show diameter sizes. Remote control valves and isolation valves shall have two (2) measurements from separate fixed objects so that triangulation of an exact coordinate for the valves may be calculated. Provide a minimum of two (2) hard copies and one digital copy (in Autodesk AutoCAD and Adobe PDF) of the as-built drawings to the CMB Greenspace Management Division for their records.

PART 2 MATERIALS

2.01 PIPE

A. PVC: As a minumum, provide Schedule 40 solvent weld unplasticized polyvinyl chloride pipe for all main and lateral lines unless otherwise specified. All pipes shall be new, unused, and free from defects and shall be continuously marked indicating size, schedule, type and Department of Commerce Standard Reference. Pipe shall be furnished in standard length of twenty (20) feet. All mainline and lateral pipe shall be manufactured from clean, virgin, NSF approved Type 1, Grade 1 PVC, conforming to ASTM design specifications D1785 and D2241. All piping placed inside sleeves shall be the same.

B. GALVANIZED STEEL PIPE: Pipe installed above grade for the backflow prevention device shall be Schedule 40 galvanized steel (reference 2.12-Paint).

C. PVC SLEEVES: Pipe used for sleeves routed under pavement, sidewalks, or other shall be polyvinyl chloride (PVC) Schedule 80 pipe unless noted otherwise. Size of all sleeves shall be able to easily accommodate specified irrigation line AND any necessary electrical conduit for electronic zone valves/other.

D. THRUST BLOCKS: Thrust Blocks shall be installed for any main line 3" or greater in diameter. Thrust blocks must be formed against a solid, hand-excavated trench wall undamaged by mechanical equipment. They shall be constructed of concrete, and the space between the pipe and trench shall be filled to the height of the outside diameter of the pipe. They shall occur at any change in direction of the mainline pipe that is 45 degrees or greater. The minimum thrust block size shall be 2 cu. ft. The thrust blocks shall also use strapping or rebar to anchor the fitting. In no instance shall the fitting be covered more than 50% so access for maintenance will not be impeded. The City Public Works Department representative shall be notified of installation at least 48 hours prior to placement and will be present while pouring to inspect the thrust blocks.

2.02 PIPE FITTINGS

A. All mainline pipe fittings shall be a minimum of Schedule 40 PVC. Make all taps on irrigation mains or branch mains with 'T' or 'Y' fittings. Provide non-threaded type joints of socket type, designed for solvent-cement type application. Prior to the connection of any joint with PVC glue, treat all fittings and pipes with a high etch (purple) PVC primer. A medium body PVC rated cement shall be used to bond each section of the PVC pipe and its fittings. Use only cleaner and solvent compatible with the PVC pipe used. Upon completion of the glue joints, keep irrigation system out of service for the period of time specified by the glue manufacturer. Make screw joints with an acceptable screw joint pipe joint compound. Where adapters are used between threaded and slipped pipes or valves, they shall be only female PVC threaded to socket coupling adapters. No male threaded PVC fittings are to be used, with the exception of street 'el's and 'funny pipe' riser adapter.

B. Galvanized steel pipe shall have threaded standard, 150 pound galvanized malleable fittings.

C. All sprinkler heads shall be connected to the supply line via adapters with ½" 'Funny Pipe', or other Public Works Department approved flexible hose, unless the intended location falls within a high traffic area or unless indicated otherwise in the Drawings or Specifications. All high traffic or anticipated high traffic areas shall utilize swing-type joints to connect heads within the area of high traffic.

2.03 PRIMER

A. Primer shall be a high etch purple primer manufactured for PVC use and intended to produce a solvent weld. The primer **must** be color-tinted to aid in visual inspection and verification.

2.04 GLUE

A. Glue shall be slow drying, heavy-duty gray or blue PVC glue. Transparent glue will not be accepted.

2.05 SPRINKLER HEADS

A. Pop-up Spray Heads: The sprinklers shall be 1800 PRS series as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California, unless otherwise specified.

1. The sprinkler shall be of the fixed spray type designed for in-ground installation, unless otherwise noted. The sprinkler shall be capable of covering the head to head radii at a minimum 30 P.S.I.

2. The nozzle shall be comprised of one (1) or more orifices at two (2) radius ranges and shall be adjustable from “On” to full “Off”. The nozzle shall elevate 3 to 6 inches when in operation. Retraction shall be achieved by a heavy-duty stainless steel spring. The nozzle piston shall have a smooth external surface operation in a resilient guide. A riser wiper shall be included in the sprinkler for continuous operation under the presence of sand and other foreign material.

3. The spray head body shall be a PRS series, with a pressure regulator built into the stem.

4. Coverage shall be either full or part circle. The part circle coverage shall be available in arcs of 45, 90, 120, 180, 240, and 270 degrees or adjustable part circle. Also included shall be special patterns including an end strip, side, and center strip nozzle configuration. Nozzle delivery shall be such as to allow partial circle patterns to match full circle patterns in precipitation rates.

5. The body of the sprinkler shall be constructed of non-corrosive, ultraviolet resistant heavy-duty plastic. A filter screen shall be in the sprinkler body. All sprinkler parts shall be removable through the top of the unit by removal of a threaded cap.

6. All sprinkler heads shall be connected to the supply line via adapters with ½” ‘Funny Pipe’, or other approved flexible hose, unless indicated otherwise in the Drawings or these Specifications.

B. Pop-Up Rotary Heads: The rotary heads shall be Falcon® 6504, 5500 or 5000 Series as manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California, unless otherwise specified.

1. The full or part circle sprinklers shall be a single stream, water lubricated, gear driven type capable of covering the specified radius in Drawings at a base pressure of 50 psi. Part circle sprinklers shall have adjustable arc coverage of 40 to 360 degrees. Arc adjustment can be performed with or without the rotor in operation and shall require only a flat blade (standard) screwdriver. The sprinkler shall be capable of full-circle operation in either the single direction or the bi-directional mode.

2. The sprinkler shall have a rotating nozzle turret independent of the riser stem. The portion of the riser stem that is in contact with the wiper seal shall be non-rotating.

3. The sprinkler shall have a pressure activated, multi-function, soft elastomeric wiper seal that will clean debris from the pop-up stem as it retracts. This wiper seal shall prevent sprinkler from sticking in the up position, and be capable of sealing the sprinkler riser stem to the sprinkler cap under normal operating pressures. The sprinkler shall have a tapered riser stem that will assist in the flushing mode of the sprinkler as it pops up, as well as when it retracts down. The tapered stem shall seal positively against the multi-function wiper seal to assure no flow-by when fully activated.

4. The sprinkler shall have a strong stainless steel retract spring for positive pop-down.

5. The rotor shall have a stainless steel covered nozzle turret and riser stem. The riser stem shall be tapered and conform to the standard plastic stem in all other ways.

6. The sprinkler shall have a screen attached to the drive housing to filter inlet water, protect the drive from clogging and simplify its removal for cleaning and flushing of the system.

C. Rainbird MPR 5 Series Bubbler Nozzles: The sprinklers shall be manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora, California, unless otherwise specified.

1. The nozzles shall have precipitation rates matched across sets and across patterns.

2. The nozzle shall be capable of covering the specified radius at a minimum pressure of 15 p.s.i. at the specified discharge rate.

3. The plastic MPR nozzle shall be constructed of UV resistant plastic. The radius adjustment screw shall be constructed of stainless steel.

4. The nozzle shall accept the non-clogging 1800 Series filter screens to allow for radius adjustment and the MPR Plastic Nozzles shall also accept the pressure compensating screens (PCS Series).

5. The nozzle shall be installed in the appropriate irrigation casing as per the manufacturer's recommendation.

2.06 IRRIGATION CONTROL WIRE

A. All irrigation control wire from the controller to the electric valve shall be UL approved PE irrigation control wire single conductor insulated, utilizing low density high molecular weight polyethylene insulation suitable for operating at 600 volts and conductor temperatures up to 60 degrees Celsius. The conductor shall be soft drawn, bare copper meeting the requirements of ASTM Specification B-3 or B-8. Temperature rating shall be from -55 degrees to +60 degrees C. Insulation thickness for conductor size is 14 AWG through 8 AWG minimum. AWG size for wire shall be in accordance with the manufacturer's specifications based upon a relationship between the number of valves and their distance from the controller.

2.07 WIRE CONNECTORS

A. All splices in irrigation control wire shall use Rainbird ST-03 UL Snap-Tite connectors and PT-S5 sealer or 3M DBY Direct Bury Splice Kit, or approved equal. All splices shall occur within approved boxes (reference 2.13-Valve Boxes).

2.08 CONDUIT

A. Conduit for irrigation wire shall be gray PVC, UL approved. Size as required by code and as set forth in these specifications. Conduit shall be used for all irrigation wire runs.

B. Conduit runs shall be assembled to be 100% waterproof and fully protect wire inside from natural elements and corrosive processes.

2.09 RISERS

A. Pipe shall be ½-inch PVC Schedule 40 or Schedule 80. Risers are to be utilized in shrub massings when conventional pop-up spray heads would provide

inadequate coverage (shrub heights of 18" or greater). Risers shall be secured to #4 steel bar, minimum with stainless steel hose clamps and shall be sized accordingly to the mature size or intended maintained size of the plant material it is scheduled to water.

B. Risers shall utilize spray nozzles connected to male threaded fittings. The nozzles shall deliver the appropriate spray radius to provide 100% coverage to the intended area while reducing overspray to non-irrigated areas.

2.10 CONTROL VALVES

A. Automatic Control (Electronic) Valves:

1. Master Control Valves: All irrigation systems are to include a controller-activated master control valve. Valves are to be sized to accommodate maximum flows allowable through the designated water meters for individual systems.

2. Zone Valves: Shall be Rainbird PESB or Public Works Department approved substitute. Each system zone shall contain an electrically activated remote control valve (size as required to maintain minimum friction loss) that shall be constructed with stainless steel trim and close normally with manual bleed plug and manual control (cross handle on 1-1/2" and 2" models; screwdriver adjustment on 1" model) or equal. Solenoid shall be 3.5 watt, 24 volt AC with tamper proof molded coil and twisting wire. Diaphragm shall be of rubber material. Tir-Act solenoid porting shall prevent a continuous flow of water through the ports during operation. Inlet port to solenoid shall be filtered with self-flushing stainless steel screen, removable from outside of valve body for maintenance. All parts shall be serviceable without removing valve from the line. Valve shall have no external plumbing or tubing that can be installed at any angle without affecting valve operation.

B. Manual Ball Valves:

1. Manual ball valves shall be installed before each automatic control valve in the system. Ball valves 4” and smaller shall be brass-type ball (globe) valves, sized to accommodate meter flow rates. Valves are to have quick disconnect union ends for maintenance/modification of piping system. They shall be installed in a valve box with cover, and, if conditions permit, may be installed in the same valve box as automatic control valves.

C. Quick Coupling Valves:

1. Shall be Rainbird 5RC Series or Public Works Department approved equal.

2. The quick coupling valve shall be a one piece type capable of having a discharge rate of up to 70 gallons per minute (GPM) with a pressure loss not to exceed 14.0 pounds per square inch (PSI).

3. The valve body shall be constructed of heavy cast brass. The cover shall be durable and self-closing. When so specified, the 5RC cover shall be a locking rubber cover (LRC).

4. The valve shall be opened and closed by a brass key from the same manufacturer.

2.11 BACKFLOW PREVENTION DEVICE

A. Backflow prevention device shall be as per City of Miami Beach Code. All connecting pipes installed above grade to be Schedule 40 galvanized steel and painted dark green (reference 2.12-Paint). Backflow Preventer shall be approved by the project irrigation consultant before order and installation.

2.12 PAINT

A. Paint for risers, rebar, and visible pipe shall be dark green, outdoor-rated weatherproof. Color sample shall be submitted to City Project Manager and or the Public Works Department representative for approval. All parts to be painted should receive the number of coats necessary to completely mask underlying, original colors/materials. Only apply paint as per manufacturer's instructions.

2.13 VALVE BOXES

A. All valve boxes, where they occur in light or infrequently traversed areas, shall be fiberglass type manufactured by Amtek or approved equal, and manufactured for the primary purpose of an in-ground irrigation box, and sized accordingly.

B. Valves shall not be placed in the path of areas that receive motorized traffic. Should it become necessary to place a valve box in more frequently traversed areas, such as areas that may receive high pedestrian volumes or the possibility of incidental maintenance vehicles, use a traffic-rated, pre-cast concrete box with a securable (bolted), galvanized iron lid. Box shall have a min. H-10 traffic loading value.

C. All valve boxes shall be placed on a min. 6" bed of pea gravel. Contractor to insure proper percolation of water and make adjustments where necessary. No standing or ponding water shall occur inside the valve box.

2.14 CONTROL SYSTEM

A. The control system shall be a new, most recent production controlled by a new, most-recent model, RainBird® ESP-LX Series electronic controller, unless an equal is approved in writing by the Public Works Department representative. Controller shall have a minimum of two (2) spare stations for future expandability.

B. Contractor shall provide the controller with a 110 volt A.C. electrical supply. The controller unit shall have input and output surge protection consisting of a GFI circuit breaker built into the controller enclosure on the input side, and a separate transformer with one relay output module for each zone on the output side.

C. The controller shall be encased in a securable, wall or rack mounted waterproof encasement unless specified otherwise.

D. Irrigation field wires shall not be brought directly into the controller enclosure. A "tray cable" **U_L®** listed for Direct Burial and Sunlight Resistant shall be connected to the controller output terminals and placed inside a valve box just outside the enclosure. These wires shall each be a #16 AWG, THWN, stranded. Each wire shall be printed on its full length with a number, and color coded. Field wires shall be connected to these wires inside the splice box utilizing approved waterproof connectors.

E. Unit shall be grounded as per the manufacturer's specifications.

F. If electrical supply is not available and with the prior written consent of the Public Works Department an Irritrol Systems IBOC Plus solar irrigation controller may be used. Battery operated On-valve type controllers are not acceptable for use.

G. Accessories:

1. Flow Meters: All flow meters shall be interchangeable types as manufactured by Bermad, Inc. or approved equal. One flow meter with pulse indicator and a master valve feature shall be installed at each connection or tap (meter locations) into the existing water line source. Flow meters shall be installed in a valve box or, when applicable a pump station, with 6" of pea gravel aggregate underneath to promote drainage. Flow meters shall be wired to the controller.

   The Bermad flow meters must be sized correctly to work accurately. Use the following flow rate / meter combinations:

   Up to 65 gpm – 1½" size
   Up to 100 gpm – 2" size

2. Detectable Underground Warning Tape: Caution Buried Irrigation Line Below - 2"W shall be installed 6" above main lines and lateral lines

3. Back-up Power Supplies: Each field unit shall each have a nickel-cadmium battery backup system in case of power loss or failure. The battery shall be nickel-cadmium 9-volt capacity and manufactured by Varta, Duracell or equal.

4. Training and Manuals - Contractor shall supply the original factory copy of controller operation/owner's manual. Contractor shall register product with manufacturer and provide a copy of completed warranty card/sheet/information to the Public Works Department representative.

2.15 BACKFILL SOIL

A. Backfill material shall be clean fill, and completely free from any rock or other material which, if it came into contact with, could damage the pipe. If material from excavation is not acceptable, then imported clean sand must be used. No rock or concrete/asphalt debris will be permitted in contact with the PVC pipe.

2.16 RAIN SENSOR

A. The rain sensor shall employ an electromechanical actuating device designed to cause a circuit interrupt that temporarily disables the irrigation controller during periods of significant rainfall.

B. The rain sensor shall be connected to the system controller to properly function and achieve its intended purpose. The device shall automatically restore the controller to a normal operating condition after a period of time subsequent to the rainfall. The device shall be suitable to be wired – normally closed (N.C.) – in series with the valve common; and, shall include a short-lead to allow wiring normally open (N.O.) when necessary.

C. The device shall be of rugged construction to withstand the elements, including exposure to sunlight (U.V.)

D. The rain sensor shall incorporate a provision that allows the installer to select from several rainfall settings.

E. The device shall include a vent ring to help control drying time of the mechanical components.

F. Rain sensor shall be securely mounted to a tangible structure, out of human reach, and clear of any overhead obstructions that may negatively impact performance. When possible, location should minimize view by the general public. Contractor to coordinate location with project Landscape Architect.

2.17 BOOSTER PUMP STATION (IF APPLICABLE) -RESERVED

PART 3 EXECUTION

3.01 GRADES

A. It shall be the responsibility of the Contractor to provide the compacting and final grading so the final level conforms to surrounding grades and is at the proper elevation with relation to walks, paving, drainage structures and other site conditions, and as identified in the general notes and specifications section of the planting plan or as directed by the Public Works Department. Depth of irrigation system components shall be measured from the FINAL grade.

3.02 PREPARATION

A. Layout of Mains and Laterals: Layout sprinkler main lines and perform line adjustments and site modification to lateral lines prior to excavation. Any conflicts shall be brought to the immediate attention of the project irrigation consultant or the Parks and Recreation Department for coordination of solution.

B. Valve Location: Locate valves to assure ease of access for maintenance and that no physical interference with other elements of the project exists. Align valves parallel to each other in manifold systems.

C. Furnish temporary support/adequate protection and maintenance from all underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the utilities work.

D. Where the grade or alignment of proposed pipe is obstructed by existing utility structures such as conduit, ducts, and pipe branch connections to sewer mains, main drains, water services, electrical lines, or other utilities, the Contractor shall notify the project manager and Public Works Department representative immediately to coordinate a solution.

3.03 PIPE INSTALLATION

A. The Contractor shall stake out the location of each run of pipe/valves prior to trenching.

B. Excavation shall include all materials encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein. The Contractor shall cause minimum disturbance to all existing conditions.

C. Any pavement cut must have the prior consent of the City of Miami Beach. All irrigation lines and wire routed under pavement and sidewalks shall be sleeved inside polyvinyl chloride (PVC) Schedule 80 pipe unless noted otherwise on the plans or in these specifications. Size of all sleeves shall be able to accommodate proposed irrigation line and any necessary electrical conduit with at least ½" excess free space.

D. Contractor shall abandon any old irrigation components found below grade during the installation of the new irrigation system except those that are to remain in operation or as directed by the project manager and the Public Works Department representative. The Contractor shall remove and dispose of the unused, abandoned irrigation components, and properly cap all lines that are still connected to a water source. Contractor shall properly cap any old irrigation system mains and branch mains as encountered at limit of construction line/scope of work where complete removal would extend outside of the limit of construction line/scope of work, except those scheduled for use with the new system.

E. Trenches shall be made wide enough to allow a minimum of 6 inches between parallel pipe lines. No lines shall be installed directly over another. Trenches for pipelines shall be made of sufficient depths to provide the minimum cover from finish grade. All main line pipes shall have a minimum cover from finish grade as per City of Miami Beach Code.

F. The pipe and fittings shall be carefully inspected before installation of the trench. All rocks and unsuitable bearing materials shall be removed from trench in strict accordance with the manufacturer's recommendations.

    1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. Fittings shall be "dry" tested for proper size before primer is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer. Once primer and glue are applied and fittings are connected tight, turn pipe or coupling ¼ turn to set. Hold joint fitting and/or components tightly together for a minimum of 30 seconds or as suggested by the glue manufacturer, whichever is greater, to allow for setting.

    2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal expansion and contraction.

    3. Pipe openings shall be temporarily plugged during construction to prevent entrance of foreign materials.

G. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. Backfill shall be placed in 6" lifts and shall be thoroughly compacted. Any backfill under pavement or sidewalks shall be compacted to 98% of maximum AASHTO T 180

density. The soil surface of backfilled trenches shall be manually settled so it is even with the surrounding soil surface grade.

3.04 SPRINKLER HEADS

A. Irrigation heads shall be installed per manufacturer's specifications and as provided in these technical specifications.

B. Provide minimum 2" ring of ½"- 5/8" diameter lightly compacted gravel around outside casing of irrigation heads to allow for proper drainage.

C. All at-grade heads are to be connected to the supply line using ½" funny pipe, or approved equal flexible pipe, and adapters, unless otherwise specified or installation is to occur in an anticipated high traffic area, in which case PVC swing joints are to be used. Allow enough slack in the funny pipe to allow for proper horizontal adjustment of the heads after installation.

D. Risers extensions are to be utilized in shrub massings when conventional pop-up spray heads would provide inadequate coverage (shrub heights of 18" or greater). Risers shall be secured to Rebar (#4) with stainless steel hose clamps. Rebar to be secured into the ground to a depth that will not allow for willing movement. Risers in shrub massings shall be a minimum of 12" from the edge of the planter bed. All risers and rebar shall be painted with a dark green color, weatherproof outdoor paint (reference 2.13-Paint). Apply number of coats necessary to completely mask any original colors underneath.

3.05 CONTROL SYSTEM

NOTE - ALL WIRE SHALL BE INSTALLED IN UL APPROVED GRAY PVC CONDUIT, except under the following conditions:

1. When the conduit is directly exposed to ultra violet light, then that exposed portion shall be rigid, threaded, heavy walled galvanized pipe.

2. When the use of PVC conduit is restricted by local, state or federal code, then the wire shall be installed in the type of conduit required by code. **NO DIRECT BURIAL WIRE INSTALLATIONS SHALL BE ALLOWED. ALL SPLICES SHALL BE TWISTED AND FULLY INSULATED FROM MOISTURE, SHALL ONLY OCCUR IN VALVE BOXES, AND ARE TO ULTIMATELY BE RECORDED IN THE AS-BUILT DRAWINGS.**

A. Contractor to install Control System including Pump System (if applicable), and all associated components, in strict accordance with the Manufacturer's Specifications and Instructions, and the Specifications contained herein.

B. Accessories:

1. Rain Sensor Device: The Rain Sensor shall be installed in a location that is free from overhead obstructions that may cause improper performance of the unit. It shall be installed in a location that is out of range of the sprinklers and away from trees or overhanging objects which might affect accumulation of rain in the rain cup. Install as recommended by the manufacturers' specifications. Furthermore, where possible, Rain Sensor shall be installed in an inconspicuous location, away from the direct visibility of passersby, and out of reach of the general public. Coordinate exact location and installation of rain switch with project Landscape Architect.

2. Backup Power Supplies: The back-up power supply for the Controller shall be installed at the same location as the Controller itself. Install as per manufacturer's specifications and specifications.

C. Training and Manuals: The Contractor, through the manufacturer, shall:

1. Provide technical and general information sheets and Operating Manuals for all equipment.

2. All manuals, technical information sheets and general information sheets shall be in duplicate and separately bound.

3.06 CONTROL WIRE INSTALLATION

A. Install control wires in UL approved PVC conduit below final grade, depth per City Code or a minimum of 18”, and lay to the side of the main line. Provide a minimum 24 in. of tightly rolled looped wire slack at valves.

B. All underground splices shall be made at electric valves in valve boxes. Splices shall utilize Rainbird ST-03 UL Snap-Tite connectors and PT-S5 Sealer or 3M DBY direct burial splice kit. Splices should be designed into the system and minimize additional splices in the field. Show all splices locations on the as-built drawings.

3.07 AUTOMATIC VALVES

A. All automatic valves shall be installed in a rectangular valve box (reference 2.13) and shall be arranged for easy adjustment and removal. A union shall be installed on the downstream side. The flow adjustment feature of each valve shall be utilized to balance operating pressures throughout the system.

B. Master Control Valves shall be located downstream from the backflow preventer in a valve box. The exact location is to be approved by the project manager and the Public Works Department representative.

B. A valve actuator shall be installed on each valve. Follow manufacturer recommendations for installation instructions.

3.08 BALL VALVES

A. Ball valves shall be installed at all paved crossings and before all automatic valves, in accordance with local codes, and arranged in valve box for easy adjustment and operation.

3.09 BACKFLOW PREVENTION DEVICE

A. Contractor to install as per plans and field-adjust as necessary, per project irrigation consultant's approval. All pipes installed above grade to be Schedule 40 galvanized steel and painted dark green.

3.10 VALVE BOXES

A. Valve boxes shall be installed so that top is flush with surrounding final grade and shall be set on a minimum of six inches of pea gravel, and as per manufacturer's recommendations. Contractor shall insure proper percolation of water to subsurface.

3.11 TESTING AND INSPECTION

A. The Contractor shall notify the project manager and the Public Works Department representative a minimum 72 hours in advance of testing, and shall coordinate as required.

B. Cleaning and pressure testing: Flush irrigation system with water to clear lines of foreign materials after system assembly is complete and prior to installation of the control valves. Cap and/or plug outlets and fill lines with water. Upon completion of the irrigation main and prior to the installation of any control valves, test the entire main line for proper construction. After completion of the flushing operation, test the main lines with 100 psi hydrostatic pressure for a minimum of 1 hour. No pressure loss shall be allowed over the duration of the test. Remove and/or replace any item or component of the system which does not comply with the test and test the entire system again until satisfactory test results are obtained. All testing shall be done in the presence of the project irrigation consultant and the Public Works Department designee. All joints, tees, elbows, caps and connections shall be left exposed during this test. Main line sections of solid unbroken pipe should be buried at intervals adequate to secure stabilization of pipe runs when pressurized. If necessary, repair any leaks and retest entire

assembly until achieving satisfactory result. Install sprinkler heads only after approval of test results by the project irrigation consultant and the Public Works Department.

C. Final inspection shall be made when the complete system is in place, operable, and all repairs, additions, adjustments, and other work is complete. At such time, the Contractor shall adequately demonstrate the proper operation of the system, shall show the system's complete conformance with the specifications, and demonstrate that the irrigation system gives proper and adequate coverage of all landscaped areas.Final test should include two-minute timed intervals of water flow per zone, allowing a one-minute down time between each zone test.

Acceptance by the project consultant and/or the City of Miami Beach in no way removes the Contractor of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered. Moreover, the Contractor shall fully honor the one-year warranty outlined herein.

3.11 RESTORATION OF EXISTING CONDITIONS

A. Contractor shall coordinate irrigation system installation, and any components thereof, with other project work to avoid disturbance of new work such as turf, planting beds, paved areas, etc. Contractor shall be responsible for and shall bear all costs of any replacement, repair, or restoration to existing conditions, new or otherwise, as a result of irrigation system installation before the time of Final Acceptance. This shall include any and all irrigation work, initial or as a result of re-installation of unacceptable components, done prior to Final Acceptance of the system. Repairs shall include like materials and conditions, equal to those being replaced or repaired, and to the satisfaction of the Public Works Department. No system shall be accepted as final until restoration is properly achieved.